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The Materiel Readiness Support (MARS) System was developed as an analytical tool to evaluate the Defense Logistics Agency's support to materiel readiness. The original documentation manual (October 1984) was designed to serve as a user's guide which would enable system adaptation for decentralized users. The current manual incorporates recent enhancements to the MARS System and has been designed to serve as a reference guide of the system's analytical capabilities for both functional and technical personnel.

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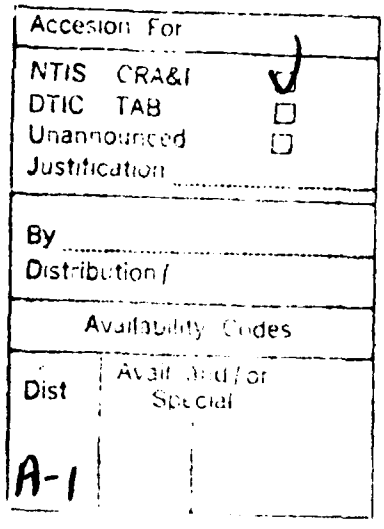
MATERIEL READINESS SUPPORT SYSTEM (MARS)

REVISED AS OF DECEMBER 1988



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DLA-LO

FOREWORD

The Materiel Readiness Support (MARS) System was developed as an analytical tool to evaluate DLA's support to materiel readiness. Previous access to the DLA-LO computer was limited. The original documentation manual (October 1984) was designed to serve as a user's guide which would enable system adaptation for decentralized users. The current manual incorporates recent enhancements to the MARS System and has been designed to serve as a reference guide of the system's analytical capabilities for both functional and technical personnel.

Christine L. Hall
for ROGER C. ROY
Assistant Director
Office of Policy and Plans

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I. INTRODUCTION

A. Background

In May 1980, the DLA Operations Research and Economic Analysis Office (DLA-LO) developed the concept of a computer model that would analyze a group of DLA-managed items that are in some way related to the materiel readiness of the U. S. Armed Forces. The analysis would show, given the inventory levels for the items, the expected supply performance for the group.

Working with the Supply Operations Directorate, DLA-LO developed general requirements for the model and increased the scope to include measures of historical supply performance. Development of the Materiel Readiness Support (MARS) system was established as a DLA command objective in March 1981.

B. System Description. The MARS system is comprised of two major analytical models. These models allow users to analyze DLA's contribution to military readiness in the following ways:

1) Historical Support Analyses. The Historical Supply Performance Program (HISPER) of the MARS system produces statistics that reflect DLA's historical support to a weapon system and/or organizational unit. Using demand history on items used by the weapon system and/or organization unit, the system identifies the supply performance for those items.

2) Projected Support Analyses

The Projected Supply Performance Model (PERMES) of the MARS system produces statistics that predict DLA's future support to selected item groupings under a variety of performance goals or budget allocations. After identifying what items are to be used, the model uses inventory control theory to compute future performance for those items. The computations involve current assets, expected requirements, and historical demand variance.

These components are accessible by means of a user-friendly interface program. This interface acts as a prompting guide for selection and input of the available options of the MARS system. A separate instruction manual, The MARS Prompting Guide Manual, is available for use with the interface program.

A MARS user may consider as readiness-related any item deemed essential to a major weapon system or to a military unit directly related to the nation's readiness posture. As described above, the system's models are designed to analyze a group of items and measure support for the items in the group. The determination of the groupings is the responsibility of the user.

C. Data Requirements

1. Data Extraction Program. Data for the MARS system are drawn from the DLA Standard Automated Materiel Management System (SAMMS) files. There are two types of data used by the MARS system; item data and requisition history data. DLA Systems Automation Center (DSAC) programs are used to create both the Item Data files and the Requisition History data file on a quarterly basis.

a. Item Data

The SAMMS sources used to develop the item data files for MARS are the Supply Control File (SCF) and the Month End Asset File (MEAF).

The created item data files consist of: information to identify and classify items (e.g., NSN, SSC); computed requirements levels (e.g., safety levels); cataloging data (e.g., unit price); asset data; demand data; and weapon system codes.

b. Requisition Data

The SAMMS sources used to develop the MARS requisition history file are the open and closed requisition history files.

The requisition history data consists of most of the entries on each incoming requisition plus information showing the disposition of that requisition. From this data we can tell for each requisition what item was ordered, how many, when, by whom, under what priority, etc. We can also tell if it was backordered, canceled, shipped, etc.

2. Model Access Data Files

a. HISPER Requisition Data

The requisition data used by the HISPER program are extracted from the requisition history file maintained within the DLA Integrated Data Bank (DIDB).

The condensed requisition data files are catalogued with the following naming conventions:

GOR.MAR.REQYYQ.X - for quarterly data
GOR.MAR.REQYY.X - for annual data

Further information for accessing these files, the format layouts, and variable definitions can be found in Section II (Historical Performance HISPER Program).

b. PERMES Item Data

The item data used by the PERMES model are developed from the item data files maintained within the DIDB.

The condensed item data files are catalogued with the following naming convention:

GOR.MAR.PERMYYQ.X

Further information on data format layouts and variable definitions can be found in Section III (Projected Performance Model PERMES).

D. Responsible Action Group. DLA-DORO is the primary point of contact for model maintenance and enhancements to the MARS system. The Technical Support Team, DLA-DORO, is responsible for production and maintenance of the MARS database.

II. HISTORICAL PERFORMANCE (HISPER) PROGRAM.

A. Introduction. The Historical Performance (HISPER) Program is a component of the Defense Logistics Agency's Materiel Readiness Support (MARS) system. The program computes historical supply performance statistics by weapon system(s), military unit(s), military service, or a combination of weapon system(s) and military unit(s). Using the MARS requisition history file and the MARS weapon system/NSN (WS/NSN) file, the program calculates and displays historical statistics on selected weapon system(s) and/or military unit(s) as specified by the user.

B. Data Requirements

The HISPER program uses requisition data by commodity and a WS/NSN file for its computations of historical supply performance. The requisition data accessed by the HISPER program are an extraction of the requisition data files maintained within the DIDB. The WS/NSN file used by HISPER is the WS/NSN file maintained within the DIDB as part of the MARS database.

The HISPER requisition data is a tape file containing 44-character records. Each record represents a customer demand placed against the DLA supply system. This file is sorted in NSN sequence and in DODAAC sequence within an NSN. The format of this record and its variable definitions are displayed in Annex II of this section.

The WS/NSN file consists of 129-character records designating items to a weapon system. This is a multiple NSN file with the records sorted in NSN sequence. More detailed information about this file, record formats, and variable definitions can be found in Section IV, The MARS Database.

1. Database Description

The HISPER program currently uses quarterly requisition data and the quarterly WS/NSN data file (Section IV, The MARS Database). During the MARS system production routine, the requisition data are reformatted and condensed to contain only weapon system-related items.

Users on the DLA-LO system can access the HISPER database using the naming conventions described in the following paragraph.

2. Naming Conventions. To standardize the procedure for assigning names to data sets containing HISPER-unique data, the following naming convention was initiated:

STANDARD DATA SET NAME FOR QUARTERLY DATA: GOR.MAR.REQYYQ.X

Where YY = Fiscal Year Specification
Q = Fiscal Quarter Specification
X = Commodity Specification
C = Construction (DCSC)
E = Electronics (DESC)
G = General (DGSC)
I = Industrial (DISC)
M = Medical
T = Textile
A = All Four Hardware Commodities

STANDARD DATA SET NAME FOR ANNUAL DATA: GOR.MAR.REQYY.X

Where YY = Fiscal Year Specification
X = Commodity Specification

C. Model Access. The MARS system is resident on the DLA Operations Research Analysis Network (DORAN). A user-friendly interface has been developed to access the HISPER program. This interface acts as a prompting guide for selection and input of the menu-driven options. By using a command language (CLIST) program, the interface interactively builds the appropriate Job Control Language (JCL) file to execute the program. Once the desired JCL is constructed in a separate program, the program can be run by submitting a batch job in TSO. Further information concerning the MARS system interface can be obtained by referencing the MARS Prompting Guide Manual.

D. Model Options. The seven HISPER options for analyzing historical performance are listed below:

1. Option A. The ALL option is the most general or aggregate level. When this option is selected, all items for a given commodity are analyzed as one group.

2. Option W. In this Weapon System option, items are separated into groups based upon item identification to selected weapon systems. Historical performance statistics are provided for each selected weapon system.

3. Option WR. This weapon system and Weapon Requisitioner option is similar to option W except that weapon system designator code requisitions are restricted to those received from the specific weapon service user.

4. Option SW. In the Service Weapon option, one set of historical performance statistics are calculated for all weapons system items related to a specified military service.

5. Option SD. In the Service DODAAC option, historical performance statistics are calculated to determine overall support to a selected military service.

6. Option D. The DODAAC option produces historical performance statistics for each DODAAC selected by the user.

7. Option WD. In the Weapon system DODAAC option, historical performance statistics are produced for each combination of weapon system and DODAAC.

E. Specification of Input Parameters. User options are identified to the HISPER programs by the parameter cards produced by the MARS user-friendly interface. The parameter card options are discussed below. A detailed description of the parameter card formats and list of valid parameter card option values can be found in Annex II.

1. Parameter Card 1. There are several various system options which are standard for all group options. These include selection of the analysis option, trouble item report, current period cutoff date, time period of data, commodity, and title.

a. Analysis Option. This option controls the selection of records for the analysis. Alternatives for this option include performing the analysis for all records, specific weapon systems, a specific weapon service, a specific requisitioning service, specific DODAACs, or specific weapon system/DODAAC combinations.

b. Trouble Item Report. The trouble item report provides detailed information for those items with a supply availability percentage less than or equal to a user specified goal.

c. Current Time Period Cutoff Date. The interface calculates the earliest requisition birth date which can be included in current time period statistics. This date is the beginning of the quarter or fiscal year for the time period analyzed.

d. Time Period of Data. This is the year or year and quarter of the data used in the analysis.

e. Commodity. This option identifies the Defense Supply Centers to be included in the analysis.

f. Title. The user can specify an optional third title line to be printed on the HISPER and the trouble item reports.

2. Parameter Card W. This card lists those weapon system designator codes to be selected for the analysis.

3. Parameter Card R. This card lists the requisitioning service to be selected for the analysis.

4. Parameter-Card D. This card lists those DODAACs to be selected for the analysis.

F. HISPER Report and Output Statistics. The following paragraphs present the report format and computed statistics for each option. More detailed explanations of the inputs are provided in Annex II.

o Parameters. User specified input parameters are presented on the HISPER Report in the following format:

HISPER Parameters Used

ID	OPTION	SA-CUT	CUTOFF	DATA-YR	DATA-QTR	COM	TITLE
1	WD	999	86001	86	2	A	

ID	SELECTION
D	M20452
D	M20450
D	M20460
D	M54062
D	M53351
D	M27121
D	M27127
D	MMC100
D	MML100
D	M28341
W	YWM

Where ID is the parameter card identification code.
Option is the user specified model option.
SA-CUT is the user specified supply availability goal for a trouble item report.
Cutoff is the current time period cutoff date.
Data-YR is the year of data used in the analysis.
Data-QTR is the data quarter.
COM is the commodity.
TITLE is a user specified optional title for the HISPER and trouble item reports.

OPTION A

This option provides statistics for all DLA-managed items by commodity. Figure II-1 provides a sample output for this option.

Figure II-1

FY 882 HISPER STATISTICS
WSDC= ALL DODAAC= ALL

IPG	CURRENT TIME PERIOD: NUMBER OF NSNS WITH DEMANDS	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	% SA	AVERAGE RESPONSE TIME DAYS	AVG IMMED ISSUE RES TIME DAYS	AVERAGE BACKORDER TIME DAYS	CURRENT + AGED BACKORDERS: NUMBER OF NSNS WITH DEMANDS	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	AVERAGE RESPONSE TIME DAYS	AVERAGE BACKORDER TIME DAYS
1	19676	49882	4791	90.4	3.3	2.7	21.7	19200	82972	7466	8.7	88.7
2	22578	98770	8801	90.1	4.4	3.7	23.0	23358	104838	15231	6.7	86.8
3	28281	306466	22402	92.7	8.4	8.1	22.3	30219	320848	36968	10.8	82.4
MIS	172	202	11	84.6	16.8	16.6	13.8	271	323	15	16.6	13.8
ALL	37311	455080	36865	91.8	7.6	7.2	22.4	38533	478378	58680	9.4	84.4

SUPPLY AVAILABILITY DISTRIBUTION

IPG	< 50% #NSNS	< 50% %DEMAND	50%-69% #NSNS	50%-69% %DEMAND	70%-79% #NSNS	70%-79% %DEMAND	80%-89% #NSNS	80%-89% %DEMAND	90%-94% #NSNS	90%-94% %DEMAND	95%-99% #NSNS	95%-99% %DEMAND	100% #NSNS	100% %DEMAND
1	1148	6.3	288	2.4	62	1.4	106	2.8	74	3.1	38	3.2	13982	78.7
2	2002	8.4	418	2.9	128	1.7	222	3.4	118	2.9	121	6.4	19566	74.3
3	2468	6.0	548	2.2	213	1.7	333	2.9	227	3.8	410	19.8	28082	80.6
MIS	10	5.0	1	1.0	0	0.0	0	0.0	0	0.0	0	0.0	161	94.1
ALL	3404	6.6	776	2.6	266	1.7	498	3.1	369	3.3	629	16.8	31377	66.8

OPTION W

This group option provides statistics for each selected weapon system. Figure II-2 provides a sample output for this option.

Figure II-2

MISPER PARAMETERS USED

ID	OPTION	SA-CUT	CUTOFF	DATA-YR	DATA-QTR	COM	TITLE
1	W	999	88001	88	2	A	

ID	SELECTION
W	20A
W	30N

FY 882 MISPER STATISTICS

WSOC= 20A

	CURRENT TIME PERIOD							CURRENT + AGED BACKORDERS				
IPG	NUMBER OF NSNS WITH DEMANDS	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	% SA	AVERAGE RESPONSE TIME DAYS	AVG IMMED ISSUE RES TIME DAYS	AVERAGE BACKORDER TIME DAYS	NUMBER OF NSNS WITH DEMANDS	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	AVERAGE RESPONSE TIME DAYS	AVERAGE BACKORDER TIME DAYS
1	1733	6453	222	96.6	2.9	2.1	22.0	1753	6687	432	4.4	78.2
2	2128	11600	475	95.9	3.1	2.7	27.9	2159	11837	667	4.4	66.4
3	2688	26832	1184	89.7	8.7	8.3	36.8	2738	27661	2181	13.2	111.0
MIS	16	20	0	100.0	12.8	12.8	0.0	26	32	0	12.8	0.0
ALL	3102	44608	1881	95.8	6.8	6.4	31.0	3162	46217	3250	8.8	84.4

SUPPLY AVAILABILITY DISTRIBUTION

	< 60%		60%-69%		70%-79%		80%-89%		90%-94%		95%-99%		100%	
IPG	#NSNS	%DEMAND	#NSNS	%DEMAND	#NSNS	%DEMAND	#NSNS	%DEMAND	#NSNS	%DEMAND	#NSNS	%DEMAND	#NSNS	%DEMAND
1	30	2.2	17	1.2	6	1.3	17	2.1	17	4.7	8	3.0	1638	85.7
2	49	1.7	36	3.7	22	1.8	44	4.6	32	4.7	18	5.2	1428	79.7
3	80	1.8	40	3.3	33	1.1	93	3.4	34	3.6	87	11.7	2382	75.0
MIS	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	16	100.0
ALL	89	2.0	43	2.4	26	1.2	68	3.3	62	6.2	85	15.1	2723	68.8

FY 882 MISPER STATISTICS

WSOC= 30N

	CURRENT TIME PERIOD							CURRENT + AGED BACKORDERS				
IPG	NUMBER OF NSNS WITH DEMANDS	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	% SA	AVERAGE RESPONSE TIME DAYS	AVG IMMED ISSUE RES TIME DAYS	AVERAGE BACKORDER TIME DAYS	NUMBER OF NSNS WITH DEMANDS	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	AVERAGE RESPONSE TIME DAYS	AVERAGE BACKORDER TIME DAYS
1	685	2845	166	94.7	2.8	2.4	24.2	697	2903	303	8.2	68.3
2	980	5458	377	93.1	4.1	3.4	28.1	968	5758	655	8.8	52.8
3	1087	14268	839	94.1	10.1	8.4	35.6	1101	15047	1554	11.6	76.6
MIS	7	12	0	100.0	16.7	16.7	0.0	12	19	0	48.6	0.0
ALL	1300	22684	1372	94.0	7.6	7.0	30.8	1322	23938	2512	9.2	68.8

SUPPLY AVAILABILITY DISTRIBUTION

	< 50%		50%-69%		70%-79%		80%-89%		90%-94%		95%-99%		100%	
IPG	#NSNS	%DEMAND	#NSNS	%DEMAND	#NSNS	%DEMAND	#NSNS	%DEMAND	#NSNS	%DEMAND	#NSNS	%DEMAND	#NSNS	%DEMAND
1	29	3.3	17	2.6	6	1.1	8	2.7	6	2.7	8	7.6	611	80.1
2	62	5.4	18	1.2	11	2.1	18	3.1	13	4.6	13	8.7	818	76.8
3	83	4.6	28	1.3	6	0.3	22	3.8	27	5.8	28	18.7	800	68.6
MIS	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	7	100.0
ALL	86	5.1	26	1.0	9	0.8	30	2.6	29	8.1	47	17.8	1063	64.5

OPTION WR

This group option provides statistics for selected weapon systems for which the requisitioner is the same service as the weapon system manager. The purpose of this option is to restrict requisitions to those received from the specific weapon service user. All requisitions by services other than the weapon system manager service are eliminated.

Figure II-3

HISPER PARAMETERS USED

ID	OPTION	SA CUT	CUTOFF	DATA YR	DATA QTR	COM	TITLE
1	WR	999	88001	88	2	A	

DODAAC SERVICE CORRESPONDS TO WSOC SERVICE

ID	SELECTION
W	20A
W	30N

FY 882 HISPER STATISTICS

WSOC= 20A

	CURRENT TIME PERIOD							AGED BACKORDERS				
IPG	NUMBER OF NSNS WITH DEMANDS	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	% SA	AVERAGE RESPONSE TIME DAYS	AVG IMMED ISSUE RES TIME DAYS	AVERAGE BACKORDER TIME DAYS	NUMBER OF NSNS WITH DEMANDS	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	AVERAGE RESPONSE TIME DAYS	AVERAGE BACKORDER TIME DAYS
1	618	1408	28	98.0	3.5	2.3	25.4	617	1414	33	3.0	68.6
2	944	1347	28	98.1	3.0	2.5	39.8	947	1363	28	3.3	39.8
3	1287	7041	209	97.0	8.4	8.0	37.7	1278	7158	308	8.7	93.8
MIS	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0.0	0.0
ALL	1469	9798	263	97.3	6.7	6.3	36.8	1478	9922	367	7.1	53.7

SUPPLY AVAILABILITY DISTRIBUTION

IPG	< 50% #NSNS	< 50% %DEMAND	50%-69% #NSNS	50%-69% %DEMAND	70%-79% #NSNS	70%-79% %DEMAND	80%-89% #NSNS	80%-89% %DEMAND	90%-94% #NSNS	90%-94% %DEMAND	95%-99% #NSNS	95%-99% %DEMAND	100% #NSNS	100% %DEMAND
1	11	1.3	2	1.0	2	1.1	0	0.0	0	0.0	0	0.0	600	96.5
2	8	1.4	1	2.0	0	0.0	0	0.0	0	0.0	0	0.0	935	96.6
3	30	1.6	7	0.4	3	4.1	4	1.3	3	0.5	0	0.0	1220	92.0
MIS	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
ALL	29	1.2	11	0.8	4	3.8	3	0.8	6	1.5	1	0.2	1415	92.2

FY 882 HISPER STATISTICS

WSOC= 30N

	CURRENT TIME PERIOD							AGED BACKORDERS				
IPG	NUMBER OF NSNS WITH DEMANDS	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	% SA	AVERAGE RESPONSE TIME DAYS	AVG IMMED ISSUE RES TIME DAYS	AVERAGE BACKORDER TIME DAYS	NUMBER OF NSNS WITH DEMANDS	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	AVERAGE RESPONSE TIME DAYS	AVERAGE BACKORDER TIME DAYS
1	428	908	77	91.5	3.3	2.6	22.9	437	984	149	7.9	74.3
2	717	2361	220	90.3	6.2	4.0	28.2	708	2852	412	6.7	49.6
3	890	4248	269	93.7	10.6	10.1	30.9	900	4484	487	11.2	98.6
MIS	2	2	0	100.0	10.5	10.5	0.0	2	2	0	10.5	0.0
ALL	1137	7817	576	92.4	7.8	7.2	28.8	1147	8023	1048	9.3	56.6

SUPPLY AVAILABILITY DISTRIBUTION

IPG	< 50% #NSNS	< 50% %DEMAND	50%-69% #NSNS	50%-69% %DEMAND	70%-79% #NSNS	70%-79% %DEMAND	80%-89% #NSNS	80%-89% %DEMAND	90%-94% #NSNS	90%-94% %DEMAND	95%-99% #NSNS	95%-99% %DEMAND	100% #NSNS	100% %DEMAND
1	24	7.1	6	1.8	3	1.7	1	1.8	0	0.0	2	4.6	392	83.1
2	66	8.8	13	1.7	6	0.8	6	2.8	4	2.7	1	1.0	690	82.4
3	59	6.8	16	1.7	4	0.9	3	0.8	1	0.4	2	1.3	806	89.5
MIS	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	100.0
ALL	81	7.1	15	1.3	5	0.9	13	1.5	11	2.8	8	3.6	1004	82.8

OPTION SW

This option provides statistics for all weapon system items related to a specified military service. Figure II-4 provides a sample output for this option.

Figure II-4

HISPER PARAMETERS USED

ID	OPTION	SA-CUT	CUTOFF	DATA-YR	DATA-QTR	CON	TITLE
1	SW	089	86001	86	- 3	C	

ID	SELECTION
_S	ALL NAVY WEAPON SYSTEMS

FY 863 HISPER STATISTICS

VSOC= ALL NAVY WEAPON SYSTEMS DODAAC= ALL

IPG	CURRENT TIME PERIOD: NUMBER OF NSNS WITH DEMANDS	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	% SA	AVERAGE RESPONSE TIME DAYS	AVG IMMED ISSUE RES TIME DAYS	AVERAGE BACKORDER TIME DAYS	CURRENT + AGED BACKORDERS 3-6: NUMBER OF NSNS WITH DEMANDS	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	AVERAGE RESPONSE TIME DAYS	AVERAGE BACKORDER TIME DAYS
1	11788	30883	3037	87.2	3.8	2.8	26.0	12588	34412	7078	8.7	82.7
2	20611	69006	8221	88.8	5.2	4.1	26.8	21834	72983	16233	9.0	62.8
3	23648	151981	13674	81.0	10.2	8.6	28.7	24987	163686	24900	12.8	80.8
MIS	116	165	8	95.2	16.4	15.8	34.7	216	280	13	10.0	34.7
ALL	32848	247748	26840	88.2	8.0	7.3	27.9	34336	270840	48222	11.3	74.7

SUPPLY AVAILABILITY DISTRIBUTION

IPG	< 80% #NSNS	< 80% %DEMAND	80%-89% #NSNS	80%-89% %DEMAND	70%-79% #NSNS	70%-79% %DEMAND	80%-89% #NSNS	80%-89% %DEMAND	90%-94% #NSNS	90%-94% %DEMAND	95%-99% #NSNS	95%-99% %DEMAND	100% #NSNS	100% %DEMAND
1	1168	11.8	171	2.2	33	1.0	57	2.0	28	1.8	19	2.7	10316	78.7
2	2261	13.7	452	2.7	78	1.0	127	1.8	67	1.8	88	2.8	17480	76.8
3	3224	8.8	528	1.8	118	0.8	226	2.0	140	2.2	337	11.4	30178	73.3
MIS	8	4.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	108	88.2
ALL	3818	10.2	811	2.1	227	1.2	368	2.1	218	2.3	423	12.7	38876	88.4

OPTION SD

This option provides overall support statistics for a selected military service. Figure II-5 provides a sample output for this option. A trouble item report is also presented.

Figure II-5

FY 882 HISPER STATISTICS

VSOC= ALL DODAAC= ALL ARMY DODAACS

IPG	NUMBER OF NSNS WITH DEMANDS	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	% SA	AVERAGE RESPONSE TIME DAYS	AVG IMMED ISSUE RES TIME DAYS	AVERAGE BACKORDER TIME DAYS	NUMBER OF NSNS WITH DEMANDS	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	AVERAGE RESPONSE TIME DAYS	AVERAGE BACKORDER TIME DAYS
	CURRENT TIME PERIOD							CURRENT + AGED BACKORDERS				
1	4472	14932	843	94.4	3.2	2.7	20.5	4598	15232	1106	4.2	31.3
2	9230	24021	1361	94.3	2.7	2.3	19.7	9316	24679	1996	4.2	32.1
3	10101	136287	6633	95.1	6.2	7.9	23.0	10284	138788	9861	8.6	33.7
MIS	19	19	1	93.3	6.7	6.7	0.0	19	19	1	6.7	0.0
ALL	11978	175259	8837	95.0	7.1	6.6	22.2	11787	178881	13064	7.6	33.2

SUPPLY AVAILABILITY DISTRIBUTION

IPG	< 90% #NSNS	%DEMAND	90%-69% #NSNS	%DEMAND	70%-79% #NSNS	%DEMAND	80%-89% #NSNS	%DEMAND	90%-94% #NSNS	%DEMAND	95%-99% #NSNS	%DEMAND	100% #NSNS	%DEMAND
1	247	5.0	80	1.7	13	1.0	17	1.0	8	1.0	1	0.2	4139	90.2
2	311	4.8	60	1.3	25	1.5	20	1.2	13	1.0	8	3.2	4782	87.9
3	703	4.0	161	1.6	81	0.8	78	2.4	30	1.3	92	3.8	9026	86.1
MIS	1	6.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	14	93.3
ALL	821	4.3	181	1.7	69	0.9	84	2.4	38	1.1	86	4.5	10309	88.2

FY 882 TROUBLE ITEM REPORT

NSN	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	% SA	AVERAGE RESPONSE TIME DAYS	AVG IMMED ISSUE RES TIME DAYS	AVERAGE BACKORDER TIME DAYS	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	AVERAGE RESPONSE TIME DAYS	AVERAGE BACKORDER TIME DAYS	VSOC	DODAAC
	CURRENT TIME PERIOD						CURRENT + AGED BACKORDERS					
1040008249843	1	1	0.0	0.0	0.0	0.0	3	3	0.0	0.0	ALL	ARMY
1055011082828	1	1	0.0	0.0	0.0	0.0	4	4	384.0	384.0	ALL	ARMY
1055011082830	2	2	0.0	0.0	0.0	0.0	5	5	0.0	0.0	ALL	ARMY
1055011082834	3	3	0.0	0.0	0.0	0.0	4	3	367.0	0.0	ALL	ARMY
1055011088601	10	10	0.0	0.0	0.0	0.0	15	14	0.0	0.0	ALL	ARMY
1055011088616	3	3	0.0	30.0	0.0	30.0	5	4	68.3	68.3	ALL	ARMY
1055011088622	3	3	0.0	0.0	0.0	0.0	4	4	0.0	0.0	ALL	ARMY
1055011070888	2	2	0.0	0.0	0.0	0.0	3	2	367.0	0.0	ALL	ARMY
1055011076874	1	1	0.0	0.0	0.0	0.0	3	3	101.0	101.0	ALL	ARMY
1055011076880	1	1	0.0	0.0	0.0	0.0	3	3	402.0	402.0	ALL	ARMY
1055011108854	8	8	0.0	48.0	0.0	48.0	12	12	48.0	48.0	ALL	ARMY
1055011123244	2	2	0.0	8.8	0.0	8.8	2	2	8.8	8.8	ALL	ARMY
1055011225657	3	3	0.0	0.0	0.0	0.0	7	6	373.0	0.0	ALL	ARMY
1055011271663	1	1	0.0	0.0	0.0	0.0	2	1	369.0	0.0	ALL	ARMY
1055011486160	5	5	0.0	36.0	0.0	36.0	7	6	204.0	36.0	ALL	ARMY
1055011568118	1	1	0.0	0.0	0.0	0.0	1	1	0.0	0.0	ALL	ARMY
1055011575507	1	1	0.0	0.0	0.0	0.0	1	1	0.0	0.0	ALL	ARMY
1055011605366	2	2	0.0	0.0	0.0	0.0	3	2	366.0	0.0	ALL	ARMY
1055011618866	1	1	0.0	0.0	0.0	0.0	1	1	0.0	0.0	ALL	ARMY
1065012486366	2	2	0.0	0.0	0.0	0.0	2	2	0.0	0.0	ALL	ARMY
1080008750888	4	4	0.0	0.0	0.0	0.0	6	5	367.0	0.0	ALL	ARMY
2080010842638	1	1	0.0	0.0	0.0	0.0	2	2	0.0	0.0	ALL	ARMY
2080011387372	1	1	0.0	0.0	0.0	0.0	1	1	0.0	0.0	ALL	ARMY
3413008648378	8	8	0.0	0.0	0.0	0.0	28	28	0.0	0.0	ALL	ARMY
3418001385374	1	1	0.0	0.0	0.0	0.0	3	3	0.0	0.0	ALL	ARMY
3418001130218	1	1	0.0	0.0	0.0	0.0	1	1	0.0	0.0	ALL	ARMY
3418001778389	1	1	0.0	0.0	0.0	0.0	3	3	0.0	0.0	ALL	ARMY
3418001778402	8	8	0.0	0.0	0.0	0.0	8	8	0.0	0.0	ALL	ARMY
3418001778413	2	2	0.0	63.0	0.0	63.0	2	2	63.0	63.0	ALL	ARMY
3431001664114	1	1	0.0	18.0	0.0	18.0	1	1	18.0	18.0	ALL	ARMY
3431008757638	1	1	0.0	0.0	0.0	0.0	1	1	0.0	0.0	ALL	ARMY
3438000181728	1	1	0.0	90.0	0.0	90.0	2	2	90.0	90.0	ALL	ARMY
3438000858472	7	7	0.0	14.0	0.0	14.0	7	7	14.0	14.0	ALL	ARMY
3438001788887	1	1	0.0	0.0	0.0	0.0	2	2	0.0	0.0	ALL	ARMY
3438007327798	3	3	0.0	0.0	0.0	0.0	3	3	0.0	0.0	ALL	ARMY
3438010877885	1	1	0.0	0.0	0.0	0.0	1	1	0.0	0.0	ALL	ARMY
3439011698472	1	1	0.0	0.0	0.0	0.0	2	2	0.0	0.0	ALL	ARMY
3439013023844	1	1	0.0	0.0	0.0	0.0	2	2	0.0	0.0	ALL	ARMY
3439012457860	1	1	0.0	0.0	0.0	0.0	1	1	0.0	0.0	ALL	ARMY
3445011784828	1	1	0.0	0.0	0.0	0.0	1	1	0.0	0.0	ALL	ARMY
3450011878032	2	2	0.0	0.0	0.0	0.0	2	2	0.0	0.0	ALL	ARMY
3458002288288	8	8	0.0	7.0	0.0	7.0	8	8	7.0	7.0	ALL	ARMY
3458002728860	8	8	0.0	21.0	0.0	21.0	28	28	21.0	21.0	ALL	ARMY
3458002930823	3	3	0.0	0.0	0.0	0.0	5	5	0.0	0.0	ALL	ARMY
3458008400813	2	2	0.0	0.0	0.0	0.0	4	4	39.0	39.0	ALL	ARMY
3460005401824	1	1	0.0	0.0	0.0	0.0	1	1	0.0	0.0	ALL	ARMY
3460005422812	1	1	0.0	0.0	0.0	0.0	1	1	0.0	0.0	ALL	ARMY
3460008215908	1	1	0.0	0.0	0.0	0.0	2	2	0.0	0.0	ALL	ARMY
3460008881257	1	1	0.0	0.0	0.0	0.0	1	1	0.0	0.0	ALL	ARMY
3460010804830	1	1	0.0	0.0	0.0	0.0	1	1	0.0	0.0	ALL	ARMY

OPTION D

This option provides statistics for each DODAAC selected by the user. Figure II-6 provides a sample output for this option.

Figure II-6

HISPER PARAMETERS USED

ID	OPTION	SA-CUT	CUTOFF	DATA-YR	DATA-QTR	COM	TITLE
1	D	999	88001	88	2	C	

ID	SELECTION
D	FB2053
D	M92320

FY 882 HISPER STATISTICS
DODAAC= FB2053
VSDC= ALL

IPG	CURRENT TIME PERIOD: NUMBER OF NSNS WITH DEMANDS	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	% SA	AVERAGE RESPONSE TIME DAYS	AVG IMMED ISSUE RES TIME DAYS	AVERAGE BACKORDER TIME DAYS	CURRENT + AGED BACKORDERS: NUMBER OF NSNS WITH DEMANDS	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	AVERAGE RESPONSE TIME DAYS	AVERAGE BACKORDER TIME DAYS
1	112	136	7	94.9	3.3	2.4	24.8	114	138	9	3.3	24.8
2	10	11	2	81.8	2.1	2.1	0.0	12	14	5	2.1	0.0
3	263	348	27	92.2	11.1	10.8	24.8	274	362	41	11.5	30.5
MIS	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0.0	0.0
ALL	360	493	36	92.7	8.5	8.0	24.8	373	514	55	8.7	33.8

SUPPLY AVAILABILITY DISTRIBUTION

IPG	< 50% #NSNS	< 50% %DEMAND	50%-69% #NSNS	50%-69% %DEMAND	70%-79% #NSNS	70%-79% %DEMAND	80%-89% #NSNS	80%-89% %DEMAND	90%-94% #NSNS	90%-94% %DEMAND	95%-99% #NSNS	95%-99% %DEMAND	100% #NSNS	100% %DEMAND
1	5	4.4	1	1.8	0	0.0	0	0.0	0	0.0	0	0.0	106	94.1
2	2	18.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	9	81.8
3	22	7.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	241	92.2
MIS	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
ALL	29	7.5	1	0.4	0	0.0	0	0.0	0	0.0	0	0.0	391	92.1

FY 882 HISPER STATISTICS
DODAAC= M92320
VSDC= ALL

IPG	CURRENT TIME PERIOD: NUMBER OF NSNS WITH DEMANDS	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	% SA	AVERAGE RESPONSE TIME DAYS	AVG IMMED ISSUE RES TIME DAYS	AVERAGE BACKORDER TIME DAYS	CURRENT + AGED BACKORDERS: NUMBER OF NSNS WITH DEMANDS	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	AVERAGE RESPONSE TIME DAYS	AVERAGE BACKORDER TIME DAYS
1	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0.0	0.0
2	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0.0	0.0
3	4	4	0	100.0	7.3	7.3	0.0	4	4	0	7.3	0.0
MIS	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0.0	0.0
ALL	4	4	0	100.0	7.3	7.3	0.0	4	4	0	7.3	0.0

SUPPLY AVAILABILITY DISTRIBUTION

IPG	< 50% #NSNS	< 50% %DEMAND	50%-69% #NSNS	50%-69% %DEMAND	70%-79% #NSNS	70%-79% %DEMAND	80%-89% #NSNS	80%-89% %DEMAND	90%-94% #NSNS	90%-94% %DEMAND	95%-99% #NSNS	95%-99% %DEMAND	100% #NSNS	100% %DEMAND
1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4	100.0
MIS	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
ALL	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4	100.0

OPTION WD

This option provides statistics for each combination of weapon system and DODAAC specified by the user. Figure II-7 displays a sample output for this option.

Figure II-7

HISPER PARAMETERS USED

ID	OPTION	SA-CUT	CUTOFF	DATA-YR	DATA-QTR	CON	TITLE
1	WD	999	88001	86	1	C	

ID	SELECTION
D	FB2083
D	N00101
W	3ON

WSDC= 3ON — FY 882 HISPER STATISTICS — DODAAC= FB2083

	CURRENT TIME PERIOD							CURRENT + AGED BACKORDERS				
IPG	NUMBER OF NSNS WITH DEMANDS	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	% SA	AVERAGE RESPONSE TIME DAYS	AVG IMMED ISSUE RES TIME DAYS	AVERAGE BACKORDER TIME DAYS	NUMBER OF NSNS WITH DEMANDS	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	AVERAGE RESPONSE TIME DAYS	AVERAGE BACKORDER TIME DAYS
1	1	1	0	100.0	2.0	2.0	0.0	1	1	0	2.0	0.0
2	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0.0	0.0
3	2	2	0	100.0	13.0	13.0	0.0	2	2	0	13.0	0.0
MIS	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0.0	0.0
ALL	3	3	0	100.0	7.8	7.8	0.0	3	3	0	7.8	0.0

SUPPLY AVAILABILITY DISTRIBUTION

IPG	< 60% #NSNS	< 60% %DEMAND	60%-69% #NSNS	60%-69% %DEMAND	70%-79% #NSNS	70%-79% %DEMAND	80%-89% #NSNS	80%-89% %DEMAND	90%-94% #NSNS	90%-94% %DEMAND	95%-99% #NSNS	95%-99% %DEMAND	100% #NSNS	100% %DEMAND
1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	100.0
2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	100.0
MIS	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
ALL	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	100.0

WSDC= 3ON — FY 882 HISPER STATISTICS — DODAAC= N00101

	CURRENT TIME PERIOD							CURRENT + AGED BACKORDERS				
IPG	NUMBER OF NSNS WITH DEMANDS	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	% SA	AVERAGE RESPONSE TIME DAYS	AVG IMMED ISSUE RES TIME DAYS	AVERAGE BACKORDER TIME DAYS	NUMBER OF NSNS WITH DEMANDS	NUMBER OF DEMANDS	NUM OF BACK-ORDERS	AVERAGE RESPONSE TIME DAYS	AVERAGE BACKORDER TIME DAYS
1	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0.0	0.0
2	1	1	1	0.0	18.0	0.0	18.0	1	1	1	18.0	18.0
3	4	7	0	100.0	8.5	8.5	0.0	5	8	1	8.5	0.0
MIS	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0.0	0.0
ALL	5	8	1	87.5	9.8	8.5	18.0	6	9	2	9.8	18.0

SUPPLY AVAILABILITY DISTRIBUTION

IPG	< 60% #NSNS	< 60% %DEMAND	60%-69% #NSNS	60%-69% %DEMAND	70%-79% #NSNS	70%-79% %DEMAND	80%-89% #NSNS	80%-89% %DEMAND	90%-94% #NSNS	90%-94% %DEMAND	95%-99% #NSNS	95%-99% %DEMAND	100% #NSNS	100% %DEMAND
1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
2	1	100.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4	100.0
MIS	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
ALL	1	12.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4	87.5

G. Annex II

1. HISPER Computations and Definitions. The computations and definitions used in HISPER are described below.

a. Current Time Period. Current time period statistics include only those requisitions with birth dates equal to or later than the current time period cutoff date. These statistics exclude aged backorders or other requisitions that were generated in previous quarters or previous years.

b. Current and Aged Backorders. Current and aged backorder statistics include all requisitions generated, satisfied, and in backorder status for the data period. Response time statistics may be skewed by extremely old requisitions from previous quarters or previous years.

c. IPG. HISPER statistics are accumulated by issue priority group. One (1) is for issue priority group IPG I, which includes requisition priorities 1-3. Two (2) is for IPG II, which includes priorities 4-8. Three (3) is for IPG III, which includes priorities 9-15. The letter 'A' is for the sum of all priorities. The letters 'MIS' indicate that the priority codes were missing or invalid.

d. Number of NSNs with Demands. A count of the items which experienced demand. NSN counts by IPG do not necessarily total to equal NSN counts for all IPGs. The same NSN may have received requisitions in more than one IPG category.

e. Number of Demands. A count of requisitions.

f. Number of Backorders. A count of requisitions with backorder codes not equal to zero.

g. Percent SA. Supply availability percent is the percentage of requisitions which could be filled without backordering. It is calculated as follows:

$$SA = 100 - [100 * B / R]$$

where SA = supply availability percent
B = number of backorders
R = number of requisitions

h. Average Response Time Days. The average number of days between the birth date (date requisition was received at the center) and the issue date for both immediate issue and backordered requisitions. Requisitions with issue dates equal to zero (open requisitions) are excluded from response time statistics but are not excluded from the number of demands or supply availability statistics. Response days are calculated as follows:

$$R = 365 * (IYR - BYR) + IDAY - BDAY$$

where R = Response days
IYR = Calendar year the requisition was issued
BYR = Calendar year it was received at the center Birth Year)
IDAY = Julian day the requisition was issued
BDAY = Julian day the requisition was received at the center (Birth Day)

Requisitions with response days less than 0 or greater than 730 are excluded from averages.

i. Average Immediate Issue Response Time Days. The average number of days between the receipt and the issue for requisitions that were not backordered.

j. Average Backorder Time Days. The average number of days between receipt and issue for backordered requisitions.

k. Items Under Supply Availability Distribution. A count of the number of items whose supply availability is in the category denoted by the column heading.

l. Percent Demand Under Supply Availability Distribution. The percent of total demand represented by the demand for the items in the category denoted by the column heading. Consequently, the sum of the percentages for an issue priority group should be 100 percent.

2. JCL Parameter Cards

a. General Options - Parameter Card 1. This JCL parameter card defines the level of analysis desired, supply availability goals for Trouble Item Report, cutoff dates, and information for titles. Each variable, its definition, options, and data field location is explained in Figure II-8. There should only be one parameter card 1, and it must be the first card.

b. Weapon System - Parameter Card W. There can be up to 50 weapon system parameter cards. Each card identifies one weapon system designator code (WSDC). Statistics will be produced for every WSDC selected which had requisitions. A more detailed explanation of this card is displayed in Figure II-9.

c. Weapon Service - Parameter Card S. There should be only one parameter card S. This card identifies the weapon system service to be selected. A more detailed explanation of this card is displayed in Figure II-10.

d. Requisition Service Parameter Card R. There should be only one parameter card R. This card identifies the requisitioning service to be selected. A more detailed explanation of this card is displayed in Figure II-11.

Figure II-8. Parameter Card 1 Description

Variable	Definition	Options	Columns From	Columns To
ID	Card Identification	-1; General Options Parameter Card	1	1
			2	(blank)
OPT	Analysis Option	-A; All records -W; By weapon system -WR; By weapon requisition -SW; By service of weapon -SD; By service of DODAAC -D; By DODAAC -WD; By weapon system and DODAAC	3	4
SAC	Trouble Item Report Supply Availability percentage cutoff	-999; No Trouble Item Report requested -XXX; Included all NSNs with supply availability percentage less than or equal to this cutoff	5	7
			8	(blank)
CDATE	Cutoff date for current period input data	-YYDDD; Julian date used to to identify the earliest birth date to be used for current time period statistics	9	13
			14	(blank)
IYR	Issue year for the input data	-YY; Fiscal year of data	15	16
IQTR	Issue Quarter for the	-1; First quarter of fiscal year -2; Second quarter of fiscal year -3; Third quarter of fiscal year -4; Fourth quarter of fiscal year - ; Leave blank for entire fiscal year	17	17
			18	(blank)

Figure II-8. Parameter Card 1 Description (Cont.)

Variable	Definition	Options	Columns From	Columns To
COM	Commodity	-C; Construction -E; Electrical -G; General -I; Industrial -M; Medical -T; Textile -A; All hardware commodities (C,E,G, and I)	19	19
			20 (blank)	
TITLE	Left justified; third line title for HISPER Report and Trouble Item Report	Any set of 53 characters. If no title is entered, the third title line will be left blank.	21	72

Figure II-9. Parameter Card W Description

Variable	Definition	Options	Columns From	Columns To
ID	Card Identification	-W; Weapon Parameter Card	1	1
			2 (blank)	
SELECT	Weapon System Designator Code	-XXX	3	5

Figure II-10. Parameter Card S Description

Variable	Definition	Options	Columns From	Columns To
ID	Card Identification	-S; Weapon Service Parameter Card	1	1
			2	(blank)
SELECT	Weapon Service based on the last position of the weapon system	-A; Army -F; Air Force -M; Marine -N; Navy	3	3

Figure II-11. Parameter Card R Description

Variable	Definition	Options	Columns From	Columns To
ID	Card Identification	-R; Requisition Service Parameter Card	1	1
			2	(blank)
SELECT	Requisition service based on first position of DODAAC	-ACW; Army -DEJ; Air Force -LM; Marine -NQRV; Navy	3	7

e. DODAAC - Parameter Card D. There can be up to 50 DODAAC cards. Each card identifies one DODAAC for selection. Statistics will be produced for each selected DODAAC which had requisitions. A more detailed explanation of this card is shown in Figure II-12.

Figure II-12. Parameter Card D Description

Variable	Definition	Options	Columns From	Columns To
ID	Card Identification	-D; DODAAC Parameter Card	1	1
			2	(blank)
SELECT	DODAAC	-XXXXXX; Enter Department of Defense Activity Address Codes to be Selected	3	8

3. HISPER Computer Model. The HISPER computer model is comprised of a preprocessing program, a SYNC-SORT utility, and a report writing program. The preprocessing program, written in Easy Retrieval and Data Manipulator (ERDM) code, is used to select, reformat, and match the records against the MARS weapon file. The advantage of ERDM is its extremely fast processing time. However, since ERDM has limited capacity for computation, a FORTRAN program is used to compute the statistics and write the reports. Copies of the HISPER code may be obtained from DLA-DORO.

4. HISPER Requisition Data

a. Production Documentation

The requisition data file accessed by the HISPER program, GOR.MAR.REQYYQ.X, consists of only those NSNs identified as weapon system items.

YYQ - Fiscal Year and Quarter
X - Commodity

where C - Construction
E - Electronics
G - General
I - Industrial
M - Medical
T - Textile
A - All four hardware commodities

This data are extracted from the requisition data files, GOR.MAR.RQNYYQ.X, maintained within the DIDB.

The programs used to select only weapon system items, condense the record format, and sort the item data by NSN and by DODAAC within an NSN were developed by the Technical Support Team, DLA-DORO.

The record layout and variable definitions for the HISPER requisition data files are presented in the following section.

b. HISPER Requisition Data Format and Variable Definitions.

Variable	Definition	Location From	Location To
R-NSN	National Stock Number	1	13
R-QUANTITY	Requisition Quantity	14	18
R-DODAAC	DODAAC ID	19	24
R-PROJ-CODE	Project Code	25	27
R-PRIORITY	Priority Code	28	29
R-BIRTH-YEAR	Date of Birth (year)	30	31
R-BIRTH-DAY	Date of Birth (day)	32	34
R-ISSUE-DAY	Issue Date	35	37
R-ISSUE-QUANTITY	Issued Quantity	38	42
R-BACKORDER	Backorder Indicator	43	43
R-CANCELLATION	Cancellation Indicator	44	44

III. PROJECTED PERFORMANCE MODEL (PERMES)

A. Introduction. The PERMES model in the MARS system is a predictive tool that can be used to forecast expected levels of performance for various supply management indicators. Mathematical equations developed from inventory control theory and DLA standards are used to predict expected supply performance levels and their associated costs. These predictions or "statistics" are produced by commodity. User-specified parameters or "goals" provide the basis for the supply performance predictions. This section will discuss the major aspects of the PERMES model as related to its data, its uses, and its mathematical formulation. Each of these concerns is separately addressed in the following paragraphs.

B. Data Requirements

The PERMES model uses quarterly item data by commodity for its computations of projected supply performance. The item data accessed by the PERMES model are an extraction of the item data files contained within the DIDB. During the MARS system production routine, the item data are condensed and reformatted for use in the PERMES model.

Each item has a 150-character record containing the necessary supply information. The format of this record and its variable definitions are displayed in Annex III of this section.

Any NSN that is identified as a weapon system (WS) item will be followed by a weapon system trailer. This 150-character trailer contains multiple 3-character WS codes for every WS identified to the NSN. To allow for the growth of weapon system and weapon system item within DoD, the fixed block layout of item data allows for multiple weapon system trailers for an NSN's item data record.

The following naming convention is used for the data sets containing PERMES - unique data:

Standard Data Set Name: GOR.MAR.PERMYYQ.X

where: YY = Fiscal Year Specification
Q = Fiscal Quarter Specification
X = Commodity Specification

C = Construction (DCSC)
E = Electronics (DESC)
G = General (DGSC)
I = Industrial (DISC)
M = Medical (DPSC)
T = Textile (DPSC)

C. Model Access

The MARS system is resident on the DLA Operations Research Analysis Network (DORAN). A user-friendly interface has been developed to access the PERMES model. This interface acts as a prompting guide for selection and input of a variety of menu-driven options. By using a CLIST program, the interface program interactively builds the appropriate JCL to operate the model. Once the desired JCL is constructed, the model can be run by submitting a batch job in TSO. A sample listing of the interface generated JCL is shown in Figure III-1.

Further information concerning the MARS system's interface can be obtained by referencing the MARS Prompting Guide Manual.

Figure III-1. Sample of an Integrated Generated JCL

```
//USERID JOB (ID#,ORG),PERMES,MSGCLASS=X,CLASS=3,
//    MSGLEVEL=(2,0),NOTIFY=USERID
//STEP1 EXEC PGM=PERMES,REGION=400K,PARM=(NOSOURCE,NOMAP,NOLIST)
//STEPLIB DD DSN=GOR.MARS.LOAD,DISP=SHR
//GO.FT06F001 DD SYSOUT=*
//GO.FT10F001 DD DSN=GOR.MARS.PERM883.G,
         DISP=OLD
//GO.FT12F001 DD DSN=&&TEMP1,
//       DISP=(NEW,DELETE,DELETE),
//       DCB=(RECFM=FB,LRECL=80,BLKSIZE=16000),
//       UNIT=3350,SPACE=(CYL,(2,2),RLSE)
//GO.FT15F001 DD *
1 3  12       0 N   0 YYYYYYYYYY YNNY N YA  TEST RUN                    1
  119F2
  10     0.0           0.   3. 1.00 1.00 1.000  74. STANDARD BASELINE  3
//
```

D. Model Options. PERMES offers five overall group options for analyzing supply performance statistics. There are various system and performance options available within each of the overall group options. These will be discussed in the next section (Specification of Input Parameters). The five overall group options are presented below:

1. Option 1. This is the most general or aggregate level. When this option is selected, all items for a commodity are analyzed as one group.

2. Option 2. This option segregates the total item population into two groups; weapon system items and nonweapon system items. Supply performance statistics are provided for each group.

3. Option 3. In this option, items are separated into groups based upon item identification to selected weapon systems. Supply performance statistics are provided for each selected weapon system.

4. Option 4. In this option, one set of supply performance statistics are calculated for all weapon system items related to a specified Military Service.

5. Option 5. This options allows for the analysis of all items used by a selected group of weapon systems. Multiple weapon systems may be selected, however, the supply performance statistics generated will reflect the support for the overall grouping of selected weapon systems.

E. Specification of Input Parameters. There are several analyses available under selected group options. The parameter options discussed below are used to specify management code items to be included in the analysis, to select alternative computations for requirements levels, to establish goals for supply performance percentages, and to test the impact of changes in policy guidance.

1. Standard System Options. There are various system options which are standard for all group options. These involve selection of the time horizon for the analysis, the run type, and the inclusion/exclusion of items based upon their management codes.

a. Time Horizon. Supply performance statistics can be projected for (1) a steady state system or (2) over one-year fixed horizon.

b. Run Type. Summary statistics can be obtained from (1) a preliminary run or (2) a complete analysis. Preliminary run statistics consist of the number of requisitions, dollar value of demand, dollar value of safety level, and the computed system constant for the item population. A complete analysis also provides the projections of supply performance.

c. Item Limit. A limit can be specified for the number of NSNs read from the data tape. This establishes a limited item population to be used for analysis.

d. SSC Selection. The user is allowed to specify items for inclusion/exclusion in the analysis based upon the item's Supply Status Code (SSC), 1-9 or A.

e. ICC Selection. The user is allowed to specify items for inclusion/exclusion in the analysis based upon the item's Item Category Code (ICC), 1, 2, B, or P.

f. New Items. The user is allowed to specify the inclusion/exclusion of new items based upon the item's Age of Item Code (AIC), N or E.

2. Standard Performance Options. For each group of items to be analyzed, the user specifies various performance options for the analysis. For example, if group option 2 (Weapon System Items and NonWeapon System Items) is selected, separate performance options will be specified for both groups. If group option 3 (Selected Weapon Systems) is selected, independent performance options will be specified for each selected weapon system.

a. Safety Level Computation. The user is allowed to specify one of six alternative methods for computing safety level requirements. These alternatives are:

0 The current system operating standard is maintained by using the data input value for safety level from the MARS item data file.

1 The SAMMS safety level value is recomputed. An input value for the system constant and the backorder lines on-hand goal (BETA) is required.

2 The Efficient Surface safety level is computed. An input value for the system constant and the backorder lines established goal is required.

3 The Service Function safety level is computed. The user specifies a desired supply availability percentage goal.

4 An Enhanced safety level is computed based upon the system input data value. The user specifies a desired supply availability percentage goal.

5 An Enhanced safety level is computed based upon a recomputed SAMMS safety level. The user also specifies a desired supply availability percentage goal.

b. Safety Level Ceilings. In accordance with DoD policy, computed safety levels are constrained by one of two factors. The first constraint deals with the standard deviation of lead time demand. A safety level ceiling factor of three limits the safety level quantity to three times the standard deviation of lead time demand. The second constraint deals with the expected lead time demand quantity. A safety level ceiling factor of one limits the computed safety level quantity to the expected lead time demand quantity. The user is allowed to adjust these current safety level ceiling factors.

c. Safety Level Policy Adjustment Factor. This is an across-the-board multiplier for computed safety level quantities. This option allows the user to specify policy reductions or increases in safety levels.

d. EOQ Computations. The user is allowed to specify one of two alternative methods for computing the economic order quantity (EOQ). These alternatives are:

(1) The current system operating standard is maintained by using the data input value for the procurement cycle period from the MARS item data file, or

(2) The EOQ is recomputed using the Wilson EOQ. The user is also given the option to adjust the T-Factor values used in SAMMS when recomputing the EOQ.

4. Group Specific Options. There are a few options which are available only for selected group options.

a. Trouble Item Report. The trouble item report provides a listing of those weapon system items whose supply availability falls below a user specified goal. This option is only available with group option 3 (Selected Weapon Systems).

b. Weapon System Indicator Code Selection

For all the group options except group option 1, the user can specify analysis of weapon system items based upon the item's weapon system indicator code (X/Y/Z). Only those items with the specified weapon system indicator code will be included in the item population.

A detailed description of the format and variable options for the parameter cards generated by the MARS interface is presented in Annex III.

F. PERMES Report and Output Statistics. The following paragraphs present the report format and computed statistics produced for each group option.

1. Parameters. User specified input parameters are presented on the PERMES Report in the following format:

DLA Material Readiness Support System
Supply Performance Predictor

Steady State

PART I CONTROL PARAMETERS

GROUP CODE	RUN TYPE	ITEM LIMIT	TROUBLE ITEM RPT	WSIC SELECTION
1	2	0	N	A

ITEM INCLUDED

/--------SSC--------/										/--ICC--/				NEW ITEMS	NON-WEAPON
1	2	3	4	5	6	7	8	9	A	1	2	B	P		
Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

COMMENTS: TEST RUN - ELECTRONICS ICP

GROUP	SAFETY LEVEL CODE	PERFORMANCE GOAL	SYSTEM CONSTANT	/-----S/L PARAMETERS---------/ STD DEV	LT DMD	ESST FACTOR	POLICY CODE	ORDER QTY CODE	T-FACTOR
1	0	0.00	000000000.	3.	1.00	1.00	1.00	0	74.0

COMMENTS: SL OPT0-STD EOQ

2. Option 1. This option projects supply availability statistics for all DLA-managed items by commodity. Figure III-2 displays the output format for Option 1. The statistics for deleted items are provided for all group options.

Figure III-2. Output Format for Option 1

PART II	SUMMARY STATISTICS
Commodity DESC	
Item Population:	xxxxxx
ITEMS DELETED:	
Supply Status Code	xxx
Item Category Code	xxx
Age of Item Code New	xxx
Zero Demand/Frequency	xxx
Zero Unit Price	xxx
Zero ALT or PLT	xxx
NonWeapon Related	xxx
Not Selected WSIC	xxx
Not Weapon Related	xxx
Not Service Related	xxx
TOTAL DELETIONS	xxx
Items in Group	xxx.
Requisitions	xxxx.
Demand Value ($000)	xxx.
Safety Level ($000)	xxx.
Computed System Constant	xxxxxx.
Enhanced SL Items	xxx
Constrained	xxx
Number of NSO Items	xxx
Expected Backorders	xxx.
Supply Availability %	xx.x%
Avg Days on Backorder	xxx.x
Avg Lines on Backorder	xxx
Avg ICP Response Time (Days)	xx.x
Commitments ($000)	xxx.
Avg Stock on Hand ($000)	xxx.
Stock Due In ($000)	xxxx.

3. Option 2. This group option provides projected statistics for DLA-managed weapon system items and nonweapon system items by commodity. Figure III-3 displays the output format for Group Option 2.

Figure III-3. Output Format for Option 2

	Weapon	NonWeapon	Total
Items in Group	xxx	xxx	xxx
Requisitions	xxxx.	xxxx.	xxxx.
Demand Value ($000)	xxx.	xxx.	xxx.
Safety Level ($000)	xxx.	xxx.	xxx.
Computed System Constant	xxxxxx.	xxxxxx.	xxxxxx.
Enhanced SL Items	xxx	xxx	xxx
Constrained	xxx	xxx	xxx
Number of NSO Items	xxx	xxx	xxx
Expected Backorders	xxx.	xxx.	xxx.
Supply Availability %	xx.x %	xx.x %	xx.x %
Avg Days on Backorder	xxx.x	xxx.x	xxx.x
Avg Lines on Backorder	xxx.	xxx.x	xxx.x
Avg ICP Response Time (Days)	xx.x	xx.x	xx.x
Commitments ($000)	xxx.	xxx.	xxx.
Avg Stock on Hand ($000)	xxx.	xxx.	xxx.
Stock Due In ($000)	xxx.	xxx.	xxxx.

4. Option 3. This group option provides projected statistics for selected weapon systems by commodity. Figure III-4 displays sample output for Group Option 3.

Figure III-4. Output Format for Option 3

SELECTED WEAPON SYSTEM:	19F
Items in Group	xxx
Requisitions	xxx.
Demand Value ($000)	xxx.
Safety Level ($000)	xxx.
Computed System Constant	xxx.
Enhanced SL Items	xxx
Constrained	xxx
Number of NSO Items	xxx
Expected Backorders	xxx.
Supply Availability %	xxx.x %
Avg Days on Backorder	xxx.x
Avg Lines on Backorder	xxx.
Avg ICP Response Time (Days)	xxx.x %
Commitments ($000)	xxx.
Avg Stock on Hand ($000)	xxx.
Stock Due In ($000)	xxx.

5. Option 4. This group option provides projected statistics for all weapon system items related to a specified service. Figure III-5 displays sample output for Group Option 4.

Figure III-5. Output Format for Option 4

PART II SUMMARY STATISTICS

THE SERVICE OF INTEREST IS:	ARMY
COMMODITY DESC ITEM POPULATION:	xxx
Items in Group	xxx.
Requisitions	xxx.
Demand Value ($000)	xxx.
Safety Level ($000)	xxx.
Computed System Constant	xxxx.
Enhanced SL Items	xxx
Constrained	xxx
Number of NSO Items	xxx
Expected Backorders	xxx.
Supply Availability %	xxx.x %
Avg Days on Backorder	xxx.x
Avg Lines on Backorder	xxx.
Avg ICP Response Time (Days)	xxx.x
Commitments ($000)	xxx.
Avg Stock on Hand ($000)	xxx.
Stock Due In ($000)	xxx.

6. Option 5. This group option provides projected statistics for a selected group of weapon systems. Figure III-6 displays sample output for this option.

Figure III-6. Output Format for Option 5

PART II SUMMARY STATISTICS

COMMODITY DGSC
ITEM POPULATION: xxxxx

SELECTED WEAPON SYSTEMS

10N
19F
36A

Items in Group	xxxx.
Requisitions	xxxx.
Demand Value ($000)	xxxx.
Safety Level ($000)	xxxx.
Computed System Constant	xxxxx.
Enhanced SL Items	xxxx
Constrained	xxxx
Number of NSO Items	xxxx
Expected Backorders	xxxx.
Supply Availability %	xx.x %
Avg Days on Backorder	xxxx.x
Avg Lines on Backorder	xxxx.
Avg ICP Response Time (Days)	xx.x
Commitments ($000)	xxxx.
Avg Stock on Hand ($000)	xxxx.
Stock Due In ($000)	xxxx.

G. Annex III

1. Mathematical Models

The mathematics involved in developing the PERMES model is briefly described in this section.

a. Supply Performance Measures

In order to derive an item's supply availability (SA):

SA = 1 - (Expected backorders/Total Frequency of demand)

it becomes necessary to determine the expected number of units backordered per year and the average number of units in a backorder status at a random point in time.

In order to determine the backorder status, the probability density function for the number of backorders at a random point in time had to be developed.

Variable Definitions

1.	σ^2	Variance of leadtime demand.
2.	μ	Mean of leadtime demand.
3.	X	Leadtime demand random variable.
4.	B	Expected number of backorders.
5.	B_T	Average number of backorders on-hand.
6.	F	Annual demand frequency.
7.	D	Annual demand quantity.
8.	T_W	Average time to fill a requisition.
9.	P_o	Probability (Stockout) = 1 - Supply Availability Percentage
10.	T_B	Average time on backorder.
11.	T_U	Average time to fill an immediate issue.
12.	Q	Order quantity.
13.	s	Safety level quantity.
14.	r	Reorder point.

Certain relationships were established to be used for both the steady state and the fixed horizon models.

From reference b (Section III.G.4), we know that B_T, the average number of backorders on hand, is also the requisition - years short incurred per year. Then the average time to fill a requisition is:

$$T_W = \frac{B_T}{F}$$

We are only concerned here with the case where the leadtime demand exceeds the reorder point and are assuming no negative safety levels, i.e.,

We also know that:

$$T_W = P_O T_B + (1 - P_O)\, T_U$$

then:

$$\frac{B_T}{F} = P_O\, T_B + (1 - P_O)\, T_U$$

and:

$$T_B = \frac{B_T}{FP_O} - \frac{(1 - P_O)\, T_U}{P_O}$$

(1) Steady state models.

(a) Replenishment items. From reference a (Annex III.G.6), we have g(y), the probability that there are y units backordered:

$$g(y) = \frac{.5}{Q} \exp(-\sqrt{2}\,(y + s)/\sigma)\,(1 - \exp\,(-\sqrt{2}Q/\sigma))$$

g(y)dy = the probability that the number of units backordered is between y and y + dy.

Therefore, the probability of a Stockout P_o is

$$P_o = \int_o^\infty g(y)dy = \frac{.5}{\sqrt{2Q}} \left(1 - \exp(-\sqrt{2Q}/\sigma)\right) \left(\exp(-\sqrt{2S}/\sigma)\right)$$

and

$$B_T = \int_o^\infty yg(y)dy = \frac{.5\sigma^2}{2Q} \left(1 - \exp(-\sqrt{2Q}/\sigma)\right)\exp(-\sqrt{2S}/\sigma)$$

We assume the probability density function of the leadtime demand distribution to be:

$$f(x) = \frac{\sqrt{2}}{2\sigma} \exp\left(-\sqrt{2}\,(x - \mu)/\sigma\right),\ x \geq \mu$$

(b) NSO models. From reference b (Annex III.G.6), we have the state probability g(y) that there are y backorders at time t:

$$g(y) = \frac{1}{Q}\left[P(y + r + 1;\mu) - P(y + r + Q + 1;\mu)\right],\ y \geq \emptyset$$

and $P_o = \sum_{y=0}^{\infty} g(y)$

$$= \frac{1}{Q}\left[\sum_{x=r+1}^{\infty} P(x;\mu) - \sum_{x=r+Q+1}^{\infty} P(x;\mu)\right]$$

Using the established relationships

$$\sum_{j=r}^{\infty} P(j;\mu) = \mu P(r - 1;\mu) + (1-r)\,P(r;\mu)$$

$$P_o \frac{1}{Q}[\alpha(r) - \alpha(r + Q)]$$

where $\alpha(r) = \mu P(r;\mu) - rP(r + 1;\mu)$

$$\therefore\quad P_o = \frac{1}{Q}[\mu P(r;\mu) - rP(r + 1;\mu) - \mu P(r + Q;\mu) + (r + Q)P(r + Q + 1;\mu)]$$

The expected number of backorders on the books B(Q,r) at any time t is:

$$B(Q,r) = \sum_{y=0}^{\infty} yg(y) = \frac{1}{Q} \sum_{y=0}^{\infty} y[P(y + r + 1;\mu) - P(y + r + Q + 1;\mu)]$$

Using the established relationships

$$\sum_{j=r}^{\infty} P(j;\mu) = \mu P(r - 1;\mu) + (1 - r)P(r;\mu)$$

and $$\sum_{j=r}^{\infty} jP(j;\mu) = \frac{\mu^2}{2} P(r - 2;\mu) + \mu P(r - 1;\mu) - \frac{r(r - 1)}{2} P(r;\mu)$$

$$B(Q,r) = \frac{1}{Q}[\beta(r) - \beta(r + Q)]$$

where $$P(r) = \frac{\mu^2}{2} P(r - 1;\mu) - \mu \cdot rP(r;\mu) + \frac{r(r + 1)}{2} P(r + 1;\mu)$$

$$\therefore \quad B(Q,r) = \frac{1}{Q}[.5\mu^2 P(r - 1;\mu) - \mu \cdot rP(r;\mu)$$

$$+ r(r + 1)(.5)P(r + 1;\mu)$$

$$- [.5\mu^2 P(r + Q - 1;\mu) - \mu(r + Q)P(r + Q;\mu)$$

$$+ (r + Q)(r + Q + 1)(.5)P(r + Q + 1;\mu)]]$$

A Poisson distribution of $p(x;\mu) = \mu^x \exp(-\mu)|x!$ is assumed for NSO items.

(2) Fixed horizon models

The fixed horizon computations basically employ a simulation metholodgy.

Given the current assets and operating parameters, the number of cycles an item experiences within a one year time frame is determined based upon occurrences of demand. These point in time snapshots of expected stock position are used to determine the probability of a stockout and the related expected number of backorders.

(a) Replenishment items. The function used to determine the probability that demand is greater than the stock on hand is:

$$f(x) = e^{-SOH/DEMAND}$$

(b) NSO items. The Poisson distribution was also employed in the fixed horizon calculations for NSO items to determine an item's probability of stockout during a cycle.

b. Levels Computations

(1) EOQ. MARS offers only one EOQ model option, the basic Wilson EOQ used in SAMMS. If this option is not selected, the system input value from the Centers' item data is used.

In inventory theory, the basic Wilson EOQ is a simple Q mode with no backordering permitted and holding costs charged only to the average on-hand inventory.

We compute EOQ by minimizing the total annual variable cost:

$$T = \frac{AD}{Q} + \frac{hcQ}{2}$$

where: A = Cost to Order

D = Annual Demand

Q = Order Quantity

h = Holding Cost Rate

c = Unit Cost

The first term $\frac{AD}{Q}$, is the annual ordering cost, D/Q being the average number of orders per year. The second term, $\frac{hcQ}{2}$ is the average annual holding cost.

To minimize T, we differentiate on Q and solve for the optimal value Q that satisfies:

$$\frac{\partial T}{\partial Q} = 0$$

$$\frac{\partial T}{\partial Q} = \frac{-AD}{Q^*} + \frac{hc}{2}$$

$$Q^* = \sqrt{\frac{2AD}{hc}}$$

(2) Variable Safety Level (VSL). MARS offers the user a choice of five VSL models. If none of these are selected, the system value from the Centers' item data is used. The SAMMS, Efficient Surface, and Service Function model all use the same basic approach; that is, to minimize total annual variable costs within a constraint on expected supply performance. The Enhanced Safety Level option uses either the input system value or a computed SAMMS safety level as a basis for determining an item's performance in relation to a supply availability goal. These models apply only to replenishment items.

(a) DoD (SAMMS) VSL

Approach: Minimize costs within a constraint on the average number of backorder lines on hand.

We have:

$$B_T = \frac{.5\sigma^2}{2QS} (1 - \exp(-\sqrt{2}Q/\sigma))\exp(-\sqrt{2}S/\sigma)$$

If we take the order point r to be $r + \mu + k\sigma$, then:

$$B_T = \frac{.5\sigma^2}{2QS} (1 - \exp(-\sqrt{2}Q/\sigma))\exp(-\sqrt{2}k)$$

We wish to minimize the sum over all items of the total annual variable cost subject to a constraint on the expected backorder lines on hand, or minimize

$$T = \sum_i \frac{AD_i}{Q_i} + hc_i\,(Q_i/2 + \mu_i + k_i\sigma_i)$$

subject to:
$$\sum_i \left[\frac{.5\sigma_i^2}{2Q_iS_i}\,(1 - \exp(-\sqrt{2}Q_i/\sigma_i))\exp(-\sqrt{2}k_i)\right] \leq \beta$$

Using the LaGrange method, the problem becomes minimize:

$$T^* = \sum_i \frac{AD_i}{Q_i} + hc_i(Q_i/2 + \mu_i + k_i\sigma_i)$$
$$+ \lambda\left[\beta - \sum_i \frac{.5\sigma_i^2}{2Q_iS_i}\,(1 - \exp(-\sqrt{2}Q_i/\sigma_i))\exp(-\sqrt{2}k_i)\right]$$

We solve for the optimum (k_i, λ) $\forall$ i

$$\frac{\partial T^*}{\partial \lambda} = hc_i\sigma_i + \frac{.5\lambda\sigma_i^2}{\sqrt{2}Q_iS_i}\,(1 - \exp(-\sqrt{2}Q_i/\sigma_i))\exp(-\sqrt{2}k_i)$$

$$\frac{\partial T^*}{\partial \lambda} = \beta - \sum_i \frac{.5\sigma_i^2}{2Q_iS_i}\,(1 - \exp(-\sqrt{2}Q_i/\sigma_i))\exp(-\sqrt{2}k_i)$$

Then (k_i, λ^*), $\forall$ i satisfies

$$\frac{\partial T^*}{\partial k_i} = \frac{\partial T^*}{\partial \lambda} = \emptyset\,, \quad \forall\ i$$

We get: $$k_i^* = -\frac{1}{\sqrt{2}} \ln \frac{-\sqrt{2Q_i} S_i h c_i}{.5(-\lambda)\sigma_i (1 - \exp(-\sqrt{2Q_i}/\sigma_i))}$$

and $$-\lambda^* = \sum_i \frac{Ac_i\sigma_i}{\sqrt{2\beta}}, \quad \text{or} \quad -\lambda^* = \frac{A}{\sqrt{2\beta}} \sum_i c_i\sigma_i$$

and the safety level is $s_i = k_i\sigma_i$.

(b) Efficient Surface Safety Level (ESSL)

Approach: Minimize costs within a constraint on total system supply availability.

We have the expected probability of a stockout as:

$$P_o = \frac{.5\sigma}{\sqrt{2Q}} (1 - \exp(-\sqrt{2Q}/\sigma))\exp(-\sqrt{2S}/\sigma)$$

The expected backorders established per year is P_oF. As in the SAMMS VSL, we want $r = \mu + k\sigma$. Then the expected backorders established per year is:

$$B_N = \frac{.5\sigma F}{\sqrt{2Q}} (1 - \exp(-\sqrt{2Q}/\sigma))\exp(-\sqrt{2}k)$$

We wish to minimize sum over all items of the total annual variable cost subject to a constraint on the expected backorder lines on hand, or minimize:

$$T = \sum_i \frac{AD_i}{Q_i} + hc_i(Q_i/2 + \mu_i + k_i\sigma_i)$$

subject to:

$$\sum_i \left[\frac{.5\sigma_i}{\sqrt{2Q_i}} F_i(1 - \exp(-\sqrt{2}Q_i/\sigma_i))\exp(-\sqrt{2}k_i) \right] \leq \beta$$

Using the LaGrange method, the problem becomes minimize:

$$T^* = \sum \frac{AD_i}{Q_i} + hc_i(Q_i/2 + \mu_i + k_i\sigma_i)$$

$$+ \lambda \left[\beta - \sum \frac{.5\sigma_i F_i}{\sqrt{2Q_i}} (1 - \exp(-\sqrt{2Q_i}/\sigma_i))\exp(-\sqrt{2k_i}) \right]$$

Differentiating on k_i and λ, we get:

$$\frac{\partial T^*}{\partial k} = hc_i\sigma_i + \frac{.5\lambda\sigma_i F_i}{Q_i} (1 - \exp(-\sqrt{2Q_i}/\sigma_i))\exp(-\sqrt{2k_i})$$

$$\frac{\partial T^*}{\partial \lambda} = \beta - \sum_i \frac{.5\sigma_i F_i}{\sqrt{2Q_i}} (1 - \exp(-\sqrt{2Q_i}/\sigma_i))\exp(-\sqrt{2k_i})$$

Then $(k^*_i \ \lambda^*)$ satisfies: $\frac{\partial T^*}{\partial k_i} = \frac{\partial T^*}{\partial \lambda} = \emptyset$

$$k_i^* = -\frac{1}{\sqrt{2}} \ln \left[\frac{Q_i hc_i}{.5(-\lambda)\ (1 - \exp(-\sqrt{2Q_i}/\sigma_i))} \right]$$

and $$-\lambda^* = \sum_i \frac{Ac_i\sigma_i}{\sqrt{2\beta}} \quad \text{or} \quad -\lambda^* = \frac{A}{\sqrt{2\beta}} \sum_i c_i\sigma_i$$

and the safety level is $s_i = k_i\sigma_i$.

(c) Service Function Safety Level

Approach: Minimize costs within a constraint on each item's expected supply availability.

As in the ESSL model, we have:

$$P_o = \frac{.5\sigma}{\sqrt{2Q}} (1 - \exp(-\sqrt{2Q}/\sigma))\exp(-\sqrt{2S}/\sigma)$$

We wish to minimize each item's total annual variable cost within a constraint on P_o the expected stockout rate, or minimize:

$$T = \frac{AD}{Q} + hc(Q/2 + \mu + k\sigma)$$

subject to:

$$\frac{.5\sigma}{\sqrt{2Q}} (1 - \exp(-\sqrt{2Q}/\sigma))\exp(-\sqrt{2k}) \leq \gamma$$

Using the LaGrange method, the problem becomes minimize:

$$T^* = \frac{AD}{Q} + hc(Q/2 + \mu + k\sigma) + \lambda \left[\gamma - \frac{.5\sigma}{\sqrt{2Q}} (1 - \exp(-\sqrt{2Q}/\sigma))\exp(-\sqrt{2k})\right]$$

$$\frac{\partial T^*}{\partial k} = hc\sigma + \frac{.5\lambda\sigma}{Q} (1 - \exp(-\sqrt{2Q}/\sigma))\exp(-\sqrt{2k})$$

$$\frac{\partial T^*}{\partial \lambda} = \gamma - \frac{.5\sigma}{\sqrt{2Q}} (1 - \exp(-\sqrt{2Q}/\sigma))\exp(-\sqrt{2k})$$

Then:

$$k^* = -\frac{1}{\sqrt{2}} \ln \left[\frac{hcQ}{.5(-\lambda)\ (1 - \exp(-\sqrt{2Q}/\sigma))}\right]$$

$$\lambda^* = (hcQ) / \sqrt{2\gamma}$$

The safety level is $s = k\sigma$.

(d) Enhanced Safety Level

The system input value for safety level is used to calculate the Probability of a Stockout (P_o) for replenishment items.

The calculated P_o is used to check an item's supply availability percentage (SA%) against the specified minimum desirable SA%.

$$P_o = \sigma * expl * exp2 / \sqrt{2} * Q$$

If an item's SA% is less than the SA goal, the safety level is readjusted using the goal established P_o to achieve the SA goal.

$$P_o^* = 1 - GOAL$$

$$P_o^* (\sqrt{2}Q) = \sigma * expl * exp2$$

$$\frac{\sqrt{2}P_o^*Q}{\sigma expl} = exp2$$

where $exp2 = .5 * \exp(-\sqrt{2} * SL/\sigma)$

$expl = 1.0 - \exp(-\sqrt{2} * EOQ/\sigma)$

$$\ell n \frac{\sqrt{2}P_o^*Q}{\sigma expl} = \ell n [.5 + \exp(-\sqrt{2}SL/\sigma)]$$

$$= \ell n .5 + (-\sqrt{2}SL/\sigma) \ \ell \ ne$$

$$\ell n \frac{\sqrt{2}P_o^*Q}{\sigma expl} = \ell n .5 = -\sqrt{2}SL/\sigma$$

$$\therefore SL = \frac{\sigma}{-\sqrt{2}} \ell n \left[\frac{2 \cdot \sqrt{2}P_o^*Q}{\sigma expl} \right]$$

2. JCL Parameter Cards

a. Overall System Constraints - Parameter Card 1. This JCL parameter card defines the overall system parameters to be used by the model. Each variable, its definition, options, and data field location is explained in Figure III-7.

b. Weapon System/Service - Parameter Card 2. This card is only used in the JCL stream if the value for the KINDSW variable on parameter card 1 (column 2-3) is set to 03, 04, or 05 (selected weapon system/Service). By setting the different values of the variables shown in Figure III-8, statistics for specific weapon systems, groups or weapon systems, or a selected Service can be computed.

c. Item Group Constraints - Parameter Card 3. This parameter card establishes the performance parameters for each group of items. As with parameter card 2, the number of parameter cards 3 required is dependent upon the value selected for the KINDSW variable on parameter card 1. These options are explained in Figure III-9.

d. Input Parameters Output Display. Part I of the PERMES report provides a printout of the values that have been entered on each parameter card. This part of the PERMES output should be checked to verify that the parameter inputs have been entered correctly. A sample of this portion of the PERMES report is shown in Figure III-10.

Figure III-7

Parameter Card 1 Description

Variable	Definition	Options	Columns From	Columns To
NSTATE	Select Steady State or One Year Fixed Horizon projection.	=1; Steady State =2; Fixed Horizon	1	1
KINDSW	Selection variable for grouping of items.	=01; All items analyzed as one group =02; Items separated into two groups. Group 1-Weapon System Items; Group 2-Nonweapon System Items. Total statistics are given. =03; Items separated into groups by identification to selected weapon systems. =04; All weapon system items identified to a specified Service are analyzed as one group. =05; All selected weapon systems are analyzed as one group.	2	3
NTC	Total number of item groups to be analyzed.	if KINDSW=01, NTC=001 if KINDSW=02, NTC=003 if KINDSW=03, NTC=nnn * NTC is dependent on the number (nnn) of selected weapon systems to be analyzed (i.e., if 5 weapon systems are to be examined, NTC=005) * NOTE: NTC $\leq$ 100. if KINDSW=04, NTC=001 if KINDSW=05, NTC=nnn	4	6
NTYPE	Selection variable for the specific run type desired.	=1; Preliminary run: Summary statistics from this run consist of the number of requisitions, dollar value of demand, dollar value of safety level, and the computed system constant. =2; Complete analysis.	7	7
			8 (blank)	

LIMNSN	Limits the number of NSNs read from the item data tape and used as the item population for analysis.	=0000000; No limit.	9	15
			16	(blank)
ITAPSW	Selection variable for receiving an output listing of items whose supply availability falls below a specified goal.	=Y; Output listing requested. * NOTE: This choice is only valid when KINDSW=03. =N; no listing requested.	17	17
			18	(blank)
NTRGOL	Specified supply availability goal for use when ITAPSW=Y.	=nnn; Enter as an integer value.	19	21
			22	(blank)
INSSC	Selection variable for inclusion of specified SSC items in analysis. Each field is used to indicate SSC items 1-9 and A, sequentially.	=Y; Include. =N; Exclude.	23	32
			33	(blank)
INICC	Selection variable for inclusion of specified ICC items in the analysis. Each field is used to indicate inclusion of ICC items 1, 2, B, and P, sequentially.	=Y; Include. =N; Exclude.	34	37

Figure III-8

Parameter Card 2 Description

A. If KINDSW = 03 or 05 (Selected weapon systems/weapon system groups):

Variable	Definition	Options	Columns From	Columns To
N	Sequence number of the selected weapon system.	=nnn *NOTE: All input parameter cards must be sequentially ordered.	1	3
LWS	Weapon system code.	=xxa (i.e., enter codes 19F, 10N, ABM.)	4	6
ICARD	Identifies the number of parameter card.	=2	7	7

NOTE : When working with selected weapon system items, the N value on the last parameter card 2 must equal the NTC value from parameter card 1. One parameter card 2 is required for each selected weapon system.

B. If KINDSW = 04 (Selected Service):

Variable	Definition	Options	Columns From	Columns To
N	Sequence number.	=001	1	3
LSVC	Code identifies selected Service.	=A; Army =F; Air Force =M; Marines =N; Navy	4	4
ICARD	Identifies the number of the parameter card.	=2	5	5

Figure III-9

Parameter Card 3 Description

If KINDSW = 01, 1 parameter card 3 is required
If KINDSW = 02, 2 parameter cards 3 are required;
one for the weapon system group, and
one for the nonweapon system group
If KINDSW = 03, NTC parameter cards 3 are required;
one card for each selected weapon system
If KINDSW = 04, 1 parameter card 3 is required
If KINDSW = 05, 1 parameter card 3 is required
Multiple weapon systems may have been selected, however, all weapon systems will be analyzed as one group with the same performance parameters.

Variable	Definition	Options	Columns From	Columns To
K	Sequence number of selected item grouping.	If KINDSW = 01, K=001. If KINDSW = 02, K value on the last parameter card 3 =002 If KINDSW = 03, K value on the last parameter card 3 must equal the NTC value from parameter card 1. If KINDSW = 04, K=001. If KINDSW = 05, K=001.	1	3
ISLSW	Selection variable for choice of safety level computation.	=0, Item data input value is used. This represents the current system operating standard. =1; SAMMS safety level value computed. *NOTE: An input value for the system constant will be required. This may be obtained from a preliminary run using safety level option 0 if not readily available. =2; Efficient surface safety level is computed. *NOTE: Same as above. =3; Service function safety level is computed. =4; Enhanced safety level based on system input is computed. =5; Enhanced safety level based on a computed SAMMS safety level.	4	4

Variable	Definition	Options	Columns	
			From	To
GOAL	Sets the desired performance goal based upon the safety level computation selected.	If ISLSW=0, GOAL=000000.00. If ISLSW=1, Enter the appropriate backorder lines on hand goal If ISLSW=2, Enter the backorder lines established goal. NOTE: This value can be obtained by multiplying the desired SA% by the requisition lines value provided by the preliminary run. If ISLSW=3, Enter the desired supply availability percentage as a decimal. If ISLSW=4, Enter the desired SA% as a decimal. If ISLSW=5, Enter the appropriate backorder lines on hand goal xxxxxx.00 (cols 5-10) and enter the desired supply availability percentage as a decimal, 000000.XX (cols 11-13)	5	13
SC	System constant.	=xxxxxxxxxxx. This value is required for any parameter card in which ISLSW = 1, 2, or 5 NOTE: If this value is not known, a computed system constant can be obtained from a preliminary run using safety level option 0.	14	25
SLMAX	Safety level ceiling factor of standard deviation of leadtime demand.	=xxxx. = 3., Standard default value = 0., Indicates no constraint. This variable allows for adjustment to the current system ceiling value.	26	30

Variable	Definition	Options	Columns From	Columns To
SLMAX2	Safety level ceiling of the expected lead-time demand quantity.	=xx.xx = 1.00, Standard default value = 0.00, Indicates no constraint. This variable allows for adjustment to the current system ceiling value.	31	35
EFACT	Safety level essentiality factor.	=xx.xx = 1.00, Standard default value * EFACT ≠ 0.	36	40
SLFAC	Safety level policy adjustment factor; this is an across-the-board multiplier for safety level quantities.	=xx.xx = 1.00; Standard default value This variable allows the user to input a SLFAC value to implement policy reductions or increases in safety levels.	41	45
IEOQSW	Selection variable for EOQ computation.	=0; Item data input value is used. =1; SAMMS Wilson EOQ computed.	46	46
TFACT	T-Factor used in SAMMS to compute the EOQ.	=xxx. = 74.; Standard default value (115. for DISC). NOTE: This value is only used if IEOQSW = 1.	47	51
KOMM2	Allows for user comments regarding item grouping.		52	71
ICARD	Identifies the number of the parameter card.	=3	72	72

Parameter Card 1: This line contains specifications for the options to establish overall system constraints.

Parameter Card 2: Selected weapon system identification.

Parameter Card 3: This line contains specifications for establishing item grouping constraints.

Figure III-10
Input Parameters Output Display

Variable	Definitions	Options	Columns From	Columns To
			38 (blank)	
INNEW	Selection variable for inclusion of AIC NEW items for analysis.	=Y; Include. =N; Exclude.	39	39
			40 (blank)	
INNONW	Selection variable for inclusion of nonweapon system items in the analysis.	=Y; Include. =N; Exclude.	41	41
NWSIC	Indicator variable for analysis of weapon system items based upon weapon system indicator code.	=A; default. No analysis based upon WSIC was requested. =X; Only weapon systems with WSIC=x are analyzed. =Y; Only weapon systems with WSIC=y are analyzed. =Z; Only weapon systems with WSIC=z are analyzed.	42	42
			43 (blank)	
KOMM1	Allows for user comments regarding system constraints or analysis.			
ICARD	Identifies the number of parameter card.	=1	72	72

IV. THE MARS DATABASE

This section offers a brief description of the requisition data files, item data files, and weapon system data files maintained within the DIDB as a support database for the MARS system. Record layouts are also presented for each data file.

The data files described are:

1. GOR.MAR.RQNYYQ.X - MARS Requisition File
2. GOR.MAR.REQYYQ.X - HISPER Weapon System Requisition File
3. GOR.MAR.PERMYYQ.X - PERMES Item Data File
4. GOR.MAR.WPNYYQ.X - Weapon System/NSN (WS/NSN) File

The YYQ.X portion of the tape name reflects the fiscal quarter and the commodity as follows:

YY represents the fiscal year
Q represents the fiscal quarter
X represents the commodity
- C = Construction
- E = Electronics
- G = General
- I = Industrial
- M = Medical
- T = Clothing and Textile

A. MARS Requisition File. GOR.MAR.RQNYYQ.X is a quarterly commodity requisition file with two record types (open or closed) depending on the key. Key = 1 represents a requisition which has been processed and all actions closed. Key = 0 indicates an open requisition.

GOR.MAR.RQNYYQ.X

FIELDS	COLUMN
KEY (RECORD TYPE)	1 - 1
COMMODITY	2 - 2
DOCUMENT IDENTIFIER CODE	3 - 5
ROUTING IDENTIFIER CODE	6 - 8
MEDIA & STATUS CODE	9 - 9
NATIONAL STOCK NUMBER	10 - 22
TYPE PACK CODE	23 - 23
UNUSED	24 - 24
UNIT OF ISSUE	25 - 26
REQUISITION QUANTITY	27 - 31
REQUISITION DOCUMENT NUMBER	32 - 45
SUFFIX CODE	46 - 46

GOR.MAR.RQNYYQ.X

FIELDS	COLUMN
SUPPLEMENTAL ADDRESS	47 - 52
SIGNAL CODE	53 - 53
FUND CODE	54 - 55
DISTRIBUTION CODE	56 - 58
PROJECT CODE	59 - 61
PRIORITY	62 - 63
REQUIRED DELIVERY DATE	64 - 66
ADVICE CODE	67 - 68
MULTIPLE USE DEPENDING ON ORIGINAL DIC	69 - 71
UNUSED	72 - 81
WEAPONS SYSTEM INDICATOR CODE	82 - 82
DATE OF BIRTH	83 - 87
BACKORDER CODE	88 - 88
CANCELLATION/REJECTION INDICATOR	89 - 89
DEPOT SHIP QUANTITY	90 - 94
DEPOT SHIP DATE	95 - 99
DIRECT DELIVERY SHIP QUANTITY	100 - 104
DIRECT DELIVERY SHIP DATE	105 - 109
CANCEL QUANTITY	110 - 114
REJECT QUANTITY	115 - 119
PASS OR REFER QUANTITY	120 - 124

B. HISPER Weapon System Requisition Data File. GOR.MAR.REQYYQ.X is a quarterly commodity requisition file which is used for the MARS Historical Performance Model. It contains selected fields from the GOR.MAR.RQNYYQ.X for weapon system items only.

HISPER Requisition File Layout and Variable Definitions

Variable	Definition	Location From	Location To
R-NSN	National Stock Number	1	13
R-QUANTITY	Requisitioned Quantity	14	18
R-DODAAC	DODAAC ID	19	24
R-PROJ-CODE	Project Code	25	27
R-PRIORITY	Priority Code	28	29
R-BIRTH-YEAR	Date of Birth (year)	30	31
R-BIRTH-DAY	Date of Birth (day)	32	34
R-ISSUE-DAY	Issue Date	35	37
R-ISSUE-QUANTITY	Issued Quantity	38	42
R-BACKORDER	Backorder Indicator	43	43
R-CANCELLATION	Cancellation Indicator	44	44

C. PERMES Item Data.

GOR.MAR.PERMYYQ.X is a quarterly commodity item file which is used for the MARS Projected Performance Model.

PERMES Item Data

Variable	Definition	Field Location From	To
KOMOD	Commodity Code	1	1
NSN	National Stock Number	2	14
UP	Unit Price	15	23
NSSC	Supply Status Code	24	24
SOH	Stock On Hand	25	33
BBO	Backorder Quantity	34	42
DUEIN	Due In Quantity	43	50
NAIC	Age of Item Code	51	51
NVIP	VIP Indicator	52	52
ICC	Item Category Code	53	53
NEIC	Essential Item Code	54	54
NFBC	Forecast Basis Code	55	55
ALT	Administrative Leadtime	56	58
PLT	Production Leadtime	59	61
PCP	Procurement Cycle Period	62	63
ALPHA	Smoothing Constant	64	65
ARS	Avg Requisition Size	66	70
SLQ	Safety Level Quantity	71	79
QNSO	NSO Quantity	80	88
AMAD	Mean Absolute Deviation	89	97
PWRMR	PWRMR	98	106
QFD	Quarterly Forecast of Dend	107	115
QFDNEN	QFD (New Items)	116	124
TDEM	Annual Demand Quantity	125	132
TFRQ	Annual Demand Frequency	133	138
NWS	Number of Weapon Systems	139	141
NWSIC	Weapon System Indicator de	142	142
FILLER		143	150
WEAPON SYSTEM TRAILER		1	150

Each WS trailer can contain up to 50 3-digit weapon system codes.

The number of weapon system trailers per NSN is directly related to the NWS code.

D. Weapon System/NSN File. GOR.MAR.WPNYYQ.X is a quarterly commodity Weapon System Designator Code (WSDC) unique, multiple NSN file. It contains selected fields from the GOR.TRAILYYQ.X RECORD TYPE-Z and the GOR.ITEMYYQ.X files. This file is used by the MARS Historical Performance Model for Weapon System/NSN selections.

WS/NSN File Layout (LRECL 129)

Variable	Definition	Record Position
DSC	Defense Supply Center	1
NSN	National Stock Number	2-14
WSDC	Weapon System Designator Code	15-17
SSC	Supply Status Code	18
UI	Unit of Issue	19-20
UP	Unit Price	21-29*
CUCA	Catalog User's Code - Army	30
CUCAF	Catalog User's Code - Air Force	31
CUCM	Catalog User's Code - Marines	32
CUCN	Catalog User's Code - Navy	33
CUCO	Catalog User's Code - Other	34
IAQ	Issuable Asset Quantity	35-43
BOQ	Backorder Quantity	44-52
AIC	Age of Item Code	53
VIP	Very Important Program Code	54
PCC	Procurement Cycle Code	55
ICC	Item Category Code	56
SLC	Shelf Life Code	57
WSIC	Weapon System Indicator Code	58
FBC	Forecast Basis Code	59
ALT	Administrative Leadtime	60-62
PLT	Production Leadtime	63- 65
PWRMR	Prepositioned War Reserve Materiel Requirement	66- 74
OWRMR	Other War Reserve	75- 83
QFD	Quarterly Forecasted Demand	84- 92
QFDN	Quarterly Forecasted Demand (New)	93-101
ADQ	Annual Demand Quantity	102-110
ADF	Annual Demand Frequency	111-117
WLC	Weapon Location Code	118-120
WEC	Weapon Essentiality Code	121
WM	Weapon Maintenance	122-123
WTD	Weapon Trx Date	124-128
WADV	Weapon Advice	129

* UP is a numerical value with a format XXXXXXX.XX.

V. MARS USER-FRIENDLY INTERFACE

A. Introduction. The MARS prompting program, or interface, is used to create the JCL necessary to execute the PERMES model or HISPER model and input data interactively into the job stream. The interface is initiated using the TSO CLIST. CLIST consists of executable sequences of TSO commands, subcommands, and command procedure statements. Using the "MARS CLIST," formally named "GOR.MARS.CLIST(BEGIN)," a user has the capability of allocating data files, executing programs interactively, and creating JCL to execute an analysis in a batch mode. This is all done automatically, in sequence, by entering one command.

B. JCL Construction

The MARS CLIST begins its execution by allocating the input and output files for the interactive prompting sessions. It then gives a brief introduction to the MARS system and asks the user to select which model he wishes to use, either PERMES or HISPER. Upon selection of a model, the CLIST will allocate a data file, specific to the user, to store the JCL needed to execute the analysis. If HISPER is chosen, the JCL file will be named "USERID.M.HISPER;" if PERMES is chosen, the JCL file will be named "USERID.M.PERMES."

After allocating a JCL file, the prompting session will begin by calling a LOAD module of the prompting program. By calling the LOAD module, the prompting program executes interactively, rather than if it were a batch job. The JCL for both PERMES and HISPER models will be constructed within their respective prompting programs, with the input data added to the job stream, and stored in its respective JCL file. At the conclusion of each prompting session, the MARS CLIST catalogs the JCL file.

The user is then asked if he wishes to submit this model run for execution on the DLA-LO computer. If the user's response is "YES," the job is submitted, a job name and number are displayed, and closing messages are issued to the user. If the user's response is "NO," the JCL file is retained until the next execution of that model and closing messages are issued to the user.

C. Programming Languages. Although the interface of the MARS system is executed by a CLIST sequence, all programs associated with the PERMES and HISPER models (i.e., the prompting program, and the analysis programs) are written in FORTRAN.

D. MARS Prompting Guide Manual. This interactive prompting program is available to users with access to the DLA-LO computer. A separate manual, "The MARS Prompting Guide," can be referenced if you require assistance in utilizing this interface.